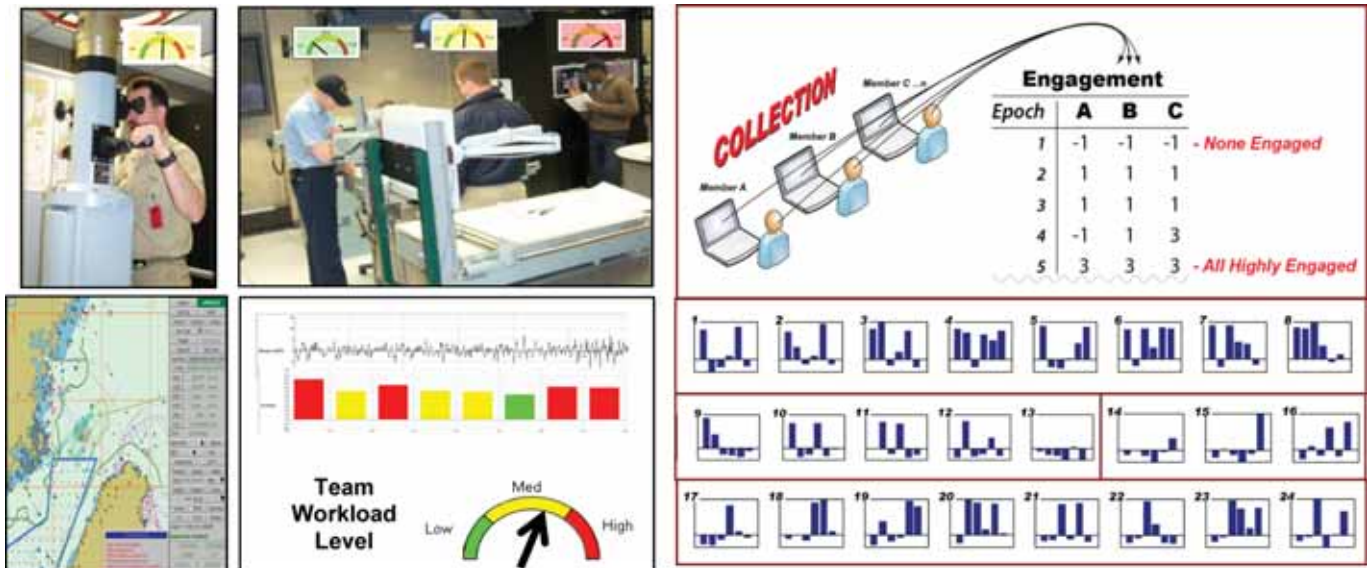
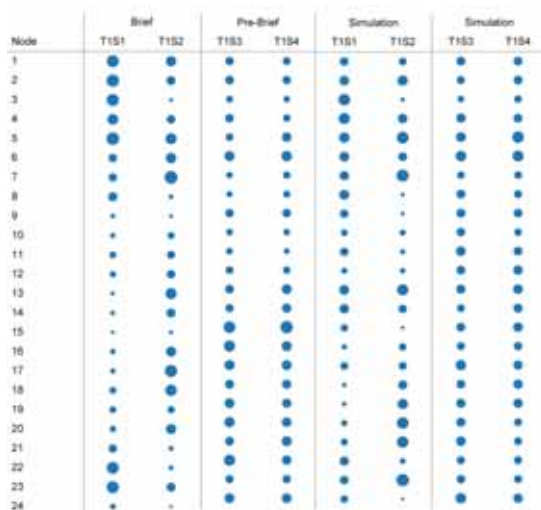


Neurophysiological Correlates of Team Performance and Group Dynamics

Team performance is impacted by each member's level of attention, engagement, distraction, and cognitive workload relative to what they are responsible for at a particular time, the progress the team has made toward the task goal, and the composition and experience of the team. In this application, scenario-based group situational awareness was assessed in two, six-member submarine officer teams across four Submarine Piloting and Navigation (SPAN) sessions using neurophysiological measures of cognitive engagement.



The framework for quantifying group neurophysiologic synchronies required the simultaneous acquisition, synchronization, and quantification of EEG-based high engagement. Each individual's engagement values across the session were normalized to account for individual differences. A value of -1 was then assigned to any one-second epoch that fell into the lowest quartile of engagement values, a value of 3 was assigned to epochs in the highest quartile, and a value of 1 assigned to epochs that fell into the middle two engagement quartiles. A neural network was then trained using these nominal values with the order of the group pre-assigned (i.e., Officer of the Deck, Contact Coordinator, Navigator, Assistant Navigator, Quarter Master on Watch and Radar). The graphs above display the 24 unique combinations of engagement identified across the six team members.



In the graph to the left, the size of the circles indicates how often each of the group engagement patterns occurred during the briefing and simulation periods across the four training sessions. During training sessions 3 and 4, which occurred five weeks after sessions 1 and 2, the sizes of the circles are more consistent across all engagement profiles. These increased consistencies in neurophysiologic synchronies are likely the result of a gain in experienced interaction among team members. This increased consistency occurred in spite of the fact that a new simulation was introduced for each session, team members rotated to different roles and responsibility by session, and the team had a past history together which may have been positive or negative.

To optimize the assessment of group performance the task/scenario specific engagement profiles associated with good or poor performance by role rather than individual is needed. This can be accomplished using experts to fill the roles and profile the scenario. Novice data can be acquired and compared to the experts, allowing individuals or roles that contribute to poor performance readily identified.

Stevens, R., Galloway, T. et al. (2009). *In the groove or Out of Synch?: Exploring a Neurophysiological Perspective of Teamwork*. Society for Neuroscience, Chicago, IL.

Stevens RH, Galloway, T. et al. (2009). *Can Neurophysiologic Synchronies Provide a Platform for Adapting Team Performance?* Human Computer Interaction International, San Diego, CA.